

"RESILIENTLY COMPENSATED WIRE TENSIONER PARTICULARLY
FOR USE IN THE FIELD OF VINE GROWING"

Field of the Invention

5 This invention relates to a particular device which
can
be used to tension wires in general and in
particular the so-called "moving metal wires" also
known as "containment wires" used in various types
of structures normally used in the layering of vines
10 and in some cases also layering in the cultivation
of other fruits.
In addition to comprising suitable elements designed
to produce the desired tensioning in the wires to
which it is applied, the device also comprises a
15 suitable resilient member which is subjected to
compression stress.

Background of the Invention

20 As is known, various types of structures to support
vines, which are normally arranged in rows and
suitably spaced apart, have been produced to form
training supports, especially in the field of vine
growing.

25 The structures of the supports essentially comprise
rows of suitable posts set vertically in the
ground and suitably spaced in line with each other,
the
30 parts that project above the soil being
interconnected by a number of horizontal wires to
support the shoots which attach themselves or are
attached thereto in various ways by various means.

35 The arrangement of such structures has progressively
evolved giving rise to a variety of configurations
which clearly depend on a number of factors such as
the type of vine or other fruit which it is desired
to grow, the manual and mechanized operations which

it is intended to carry out, etc.

The materials used have also progressively evolved, and in fact the posts, which were initially obtained from suitable pieces of wood, have now been almost entirely replaced by cement or metal components having cross-sections of various shapes often comprising suitable members for the attachment of horizontal wires. Also the wires which are stretched between the aforesaid posts, which, as is well known, used to comprise zinc-coated iron wires, have been replaced by stainless steel wires or metal wires obtained using special technologies.

In the arrangement, which is currently the most widespread in the field of vine growing, the support structure always comprises a plurality of equally spaced posts in line with each other, which are interconnected by a fixed horizontal wire known as the "supporting wire", or also the "training wire", which is fixed to the posts at a suitable height above the surface of the ground. At least one pair of wires, which are parallel to each other and positioned on corresponding sides of the supporting structure in question, and which in the specific field are commonly referred to as "containment wires" or also "moving wires" because, as is known, they are positioned at various heights above the ground during the various stages of cultivation, which take place throughout the year, are also attached to two posts located at the ends of each row. Initially these "moving wires" were fixed at least one of their ends to a corresponding post at a corresponding end of the corresponding row using attachment members provided with a suitable hooking member or suitable clamps referred to as "wire clamps".

As a result, in order to carry out each individual movement, they first had to be slackened off, and

5 then, when slackened off, positioned where necessary and finally retensioned. This procedure is complex and tiresome, requiring the employment of at least two persons and substantial working times, with consequent costs which are obviously appreciable.

10 In order to overcome these disadvantages and simplify the whole procedure, it has recently been the practice to place a helical spring working under tension between at least one of the ends of the "moving wires" and

15 the corresponding 'post to which that end is fixed. However, this arrangement in turn brings about not insubstantial disadvantages, because the maximum strength of the tension spring used must, for obvious reasons, be substantially less than that used when

20 handling the moving wire. A result, when high random loads act even for very short periods, such as those caused by the thrust of the wind ("sail" effect) or the action of mechanical operations or those deriving from random impacts caused involuntarily through the incorrect maneuvering of various machines {tractors-weeders, mechanical harvesters, etc.), among others, the aforesaid spring is overstretched, and being therefore permanently deformed has to be replaced. Given the random nature of the causes which might produce permanent damage to the spring, the necessary replacements of the same are obviously virtually unquantifiable and in any event numerous, as a result of which, the consequent costs for maintaining an efficient supporting structure are also unquantifiable, but obviously always high.

Summary of the Invention

40 The object of this invention is to overcome the abovementioned disadvantages and this is achieved through a resiliently compensated wire tensioner. A resilient wire tensioner for tensioning wires of vine supports, the vine supports including a post, said resiliently wire tensioner comprising a first hooking

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5 member configured to be secured to the post of the
vine supports; a second hooking member having slots;
a helical spring extending in a longitudinal
direction and located between said first hooking
member and said second hooking member; a winding
10 member configured to be rotatably received by said
slots, said winding member extending transversally
relative to the longitudinal direction of said
helical spring and further configured to enable
adjustable tensioning of the wires of the vine
15 supports; and an immobilizing member configured to
couple to said winding member and said second hooking
member to prevent rotation of said winding member
which is the object of this invention and which is
described in detail in a preferred embodiment purely
20 by way of example and without limitation with
reference to the appended drawing in which.

Brief Description of Drawings

25 Figure 1 illustrates a generic vine support in side
view with the application thereto of the resiliently
compensated wire tensioner to which this invention
relates,

30 Figure 2 illustrates a perspective view of the
particular conformation and construction of the
entire device comprising the resiliently compensated
wire tensioner which is illustrated purely
generically and diagrammatically in Figure 1, and

35 Figure 3 illustrates in detail a perspective view
equivalent to that in Figure 2 of the particular
conformation of the individual elements comprising
the
40 device illustrated as a whole in that figure.

Detailed Description of the Invention

It is pointed out that common details will be
indicated using the same reference numbers.

With reference to Figure 1, it is noted that the
5 resiliently compensated wire tensioner T is first
applied to a vine supporting
structure constructed in one of the possible various
known conformations. As may be clearly seen from
Figure 1, the supporting structure illustrated
10 essentially comprises a plurality of posts positioned
in line and suitably spaced apart. As is
known, these posts may comprise suitable wooden or
cement or even metal members with a variety of
transverse cross-sections and are often provided with
15 elements and/or devices for hooking metal wires to
them. For clarity, the posts standing at the
extremities
of the supporting structure are identified by the
reference PE and the intermediate posts by the
20 reference PI. A fixed wire FM known as the "supporting
wire" or "training wire" is attached to all the
aforesaid posts PE and PI at a suitable height above
the ground, and the end posts PE are suitably braced
with suitable bracing wires FC. Corresponding wire
25 tensioners with elastic resilience T are also attached
to the two end posts PE at a suitable distance from
the
ground (in the example arrangement to which reference
is made in a position somewhat above that at which the
30 aforesaid "supporting wire" FM is attached) and the
free ends of these are in turn connected to the two
corresponding ends of a pair of "moving wires" F.
Given the resilience of the aforesaid resiliently
compensated wire tensioner T these moving wires F can
35 be secured by
simple hooking operations to suitable hooking members
G provided in or attached to corresponding
intermediate post PI in order to be positioned at
different heights above the ground. A numerical
40 symbol is added to the 'common reference F' to
indicate the various possible

5 positions of the moving wires F, but only one position, that identified by F3, is indicated by an unbroken line while the others, specifically the two lower positions and the one above that position (F3) identified by F1, F2 and F4 respectively, are indicated by dashed lines.

10 It is pointed out that in the embodiment of the vine support to which reference is made it is indicated that two "resiliently compensated wire tensioners" T are fitted to the corresponding two extremities of the pair of moving wires F. It is clear that
15 especially in the case of supports of limited length, and in any event depending upon the functional characteristics of such "resiliently compensated wire tensioners" T, a single element T may be used and
20 attached to just one extremity of the said pair of wires F.

Now that the description of the attachment of the device in question ("resiliently compensated wire
25 tensioner") T to a generic vine support has been described, the composition, conformation and functioning of the same (T) will now be described in detail with reference to Figures 2 and 3. As may be seen particularly clearly, especially from Figure 3, it will be noted that the
30 entire resiliently compensated wire tensioner T comprises only five elements of which four can be easily produced from suitable round bars or wires of suitable steel through bending operations, and
35 one of which can instead be obtained from a suitable metal drawn section through drilling and turning operations.

Essentially the constituent components are: a helical spring 1, a first hooking member 2 for attaching the device T to a corresponding end post PE of a vine
40 support (see Figure 1), a second hooking member 3 for supporting a suitable component 4 for winding the moving wires F of a vine support (see Figure 1) and

finally a securing hook 5 to fix winding component 4 in an operating position.

- 5 Then making reference first to Figure 3 and then to Figure 2, the composition, conformation, mutual interconnection and particular function of the individual components referred to above will be described in greater detail. Helical spring 1 is
10 obtained in a known way from a suitable round bar or suitable steel, and since it will be stressed in compression when in operation, it is shaped in such a way that its turns are set apart from each other by a certain amount in order to allow suitable shortening when placed under load. The first hooking
15 member 2 comprises a suitable piece of steel (or other suitable metal) wire which is wound centrally to form two turns 21 with a suitable diameter to permit attachment to a corresponding end post PE for a line support corresponding to the resulting device T. At the
20 extremities 211 and 212 of these two turns 21, as may be clearly seen in Figure 3, the extremities (211-212) are
25 slightly spaced apart, the steel wire is radially bent back externally in such a way as to form two straight lengths 22, which are substantially parallel to
30 each other and coplanar with the aforesaid two turns 21. These straight lengths 22 terminate at their free extremities into two short sections then outwards in the same plane to form corresponding curved members 23 substantially in a "hook" shape, which as will be described below will be hooked onto
35 the final turn at one end of helical spring 1. It is pointed out that the length of the aforesaid two straight lengths. 22 will be suitably slightly greater than the length of helical spring 1.
- 40 Similarly to first hooking member 2, second hooking member 3 comprises a suitable length of steel (or other suitable metal) wire which is bent centrally

5 in order to form a first straight length 31 which is a little longer than the diameter of said helical spring 1. Two short straight lateral lengths 32 depart from the extremity of first straight length 31 at right angles, from the extremities of which two
10 further straight lengths 33 of a particular length (approximately twice the diameter of helical spring 1) depart again at right angles but slightly converging with each other. These straight lengths 33
15 are finally attached by two semi-circular lengths 34 to further corresponding two straight lengths 35 extending in the same plane and substantially parallel to each other, passing through the space between the first
20 straight length 31 and the corresponding lateral lengths 32. These straight lengths 35 extend beyond the area defined by the first straight length 31 for a distance which is slightly longer than helical
25 spring 1 and terminate at their free extremities in two short lengths which are bent outwards in the same plane to form corresponding curved members 36 of a substantially "hook" shape, which are wholly
30 identical to corresponding curved members 23 of first hooking member 2, and which as described below will hook onto the terminal turn of helical spring 1 at the end opposite to that at which the aforesaid curved members.
35 23 of first hooking member 2 are hooked.

As may be clearly seen in particular from Figure 3, winding member 4 comprises a single length of a section having a hexagonal cross-section which is obtained by cutting this portion off from a
40 corresponding bar. The winding member has a length equal to approximately a little more than three times the diameter of helical spring 1 and in its central part there are provided two annular grooves 41 spaced apart by as much as semicircular lengths 34 and shaped and dimensioned in such a way as to

allow the latter (34) to penetrate the former (41).
Close to the lateral extremities of the length of
5 section forming this winding member 4, close to
grooves 41, there
are provided suitable through holes, and
specifically two outer through holes 42 and two
inner through holes 43. Through holes 42 will have a
10 diameter sufficient to permit passage of the
extremities of corresponding moving wires F which,
as described below, will be wound
on winding member 4 during the tensioning operation,
and the inner through holes will have a diameter
15 sufficient to permit the shank 51 of said
immobilizing hook 5 to be inserted freely therein.
It is pointed out that in practice outer holes 42
and inner holes 43 will be the same diameter, and
above-mentioned winding member 4 may instead of
20 being obtained from a hexagonal section, also be
obtained from a round metal bar of suitable
dimensions, in which case it will be necessary to
consider the use of different operating
systems and/or means. Finally, as may be clearly seen
25 from Figure 3, said immobilizing member 5 comprises
a single piece of metal wire shaped in such a way as
to form a straight length 51, which is bent back at
one extremity to form a hook-shaped part 52.

30 After the detailed description of the composition and
conformation of the individual members making up the
wire tensioner (T), their assembly and the operation of
the resulting device (T) will be described
summarily.

35 The two hooking members 2 and 3 are first inserted
into helical spring 1 causing them to penetrate
opposite
each other. Clearly when inserted, corresponding
40 curved members 23 and 36 will hook onto
corresponding terminal turns located at the opposite
extremities of helical spring 1. Winding member 4 is
then inserted- into the resulting space (or slots)
between straight lengths 32, 33 and part of straight

lengths 35 of second hooking member 3, also causing semi-circular lengths 34 of that second hooking member 3 to penetrate within the two annular grooves 41. The entire device (T) is then complete and ready for use, when it is arranged as illustrated in Figure 1.

In practice, the unit of turns 21 of device T is first placed onto a corresponding end post PE of a vine support in a known way and then the extremities of the two moving wires F are inserted into the two outer through holes 42 of corresponding winding member 4. At this point winding member 4 is caused to rotate through use of a suitable tool, such as a suitable key, so that moving wires F are progressively wound thereon and consequently will be progressively tensioned if they are secured at the opposite extremity. Once the desired tension has been achieved, which can be advantageously and very easily evaluated merely by checking the shortening of helical spring 1, the operator will secure the whole by inserting straight length 51 of said immobilizing member 5 into one of inner through holes 43 provided in winding member 4 and positioning corresponding hook part 52 on a corresponding part of one of the straight lengths 33 of second hooking member 3.

Clearly the tension which it is desired to impart may vary widely, and for normal uses with the application of two normal devices T at the extremity of a support, as illustrated in Figure 1, the maximum tension which it is desirable to apply may cause shortening of the two corresponding helical springs 1 which is less than 50% of the maximum amount of shortening which the latter can undergo, that is the value beyond which

5 there would be irreversible damage to the structure of the support, although as said helical spring 1 in device T according to this invention works in compression it can never undergo permanent deformation (overstretching).

10 The appreciable advantages which the device comprising the resiliently compensated wire tensioner according to this invention can achieve are clear.

15 Firstly, as mentioned above, any accidental, even large overloads, will be supported without causing irreversible damage to either the structure of the support or the spring of the device, which instead, as is known and has already been mentioned, frequently

20 occurs in arrangements using springs working under tension. Both the cost of the damping device, that is the spring operating under tension, and the time and corresponding cost of the corresponding replacement operation are thus avoided. In addition to this already

25 significant advantage, use of the new device simplifies and eases the operation of moving the moving wires in a truly substantial way, in fact in order to perform that operation it is no longer necessary to employ at least two or often even more persons on each occasion before

30 unhooking the ends of the moving wires in order to allow another person or more often other persons to perform the necessary repositioning and then proceed with retensioning the moving wires after
35 repositioning.

With the new device one person can very easily carry out the desired movements without requiring the assistance of any other persons, unless in certain circumstances it is useful or necessary to change
40 the position of these moving wires in order to unhook and retension the same, a single person will always be capable of carrying out everything in a very simple

5 way and practically without effort by acting on winding member 4. There is therefore not only the advantage of reducing the personnel which has to be used for these operations, but also that of simplifying them, speeding them up and making them possible virtually without effort, which obviously
10 also brings about a consequent further appreciable economic advantage.

It is desirable to point out that, in particular, the system for hooking device T to the corresponding
15 end post PE described above may vary widely in both form and manner and in the means of application. Instead of the system described and illustrated which provides for formation of the two turns 21 mentioned, other possible equivalent
20 variant hooking systems may obviously be provided. A suitable metal band having various shapes and dimensions corresponding to the shape and dimensions of the part of the post to which it is wished to apply, such device T may for example be used. In this case
25 the band in question will also be provided with suitable fixing means. Another possible variant may consist of dividing the entire device T into two parts, the first part comprising helical spring 1 and a second
30 part comprising only winding member 4. These two parts separated in this way may be secured to corresponding posts PE at the opposite extremities of a
35 corresponding support with suitable means such as, in particular for the part comprising helical spring 1, a component identical to hooking member 2 referred to in the description or, as stated above, hooking systems
40 equivalent to this and essentially for securing only the tensioner comprising winding member 4. In this possible variant the pair of moving wires F will be fixed to winding member 4 (or equivalent) at one end and. to a hooking member similar to second

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5 hooking member 3 referred to in the description at
the other. Clearly, the new hooking member will be
modified in comparison with hooking member 3 only in
the part relating to the attachment of the two ends
of the pair of moving wires F, the remainder always
10 behaving
in such a way that helical spring 1 only works under
compression. In addition to this it will be possible
to vary members 2 and 3 in such a way that when
inserted into spring 1 they project with small
15 eyelets for attaching moving wires F thereto (2-3)
without these (2-3) being provided with tensioning
members 4, etc., which will be fitted in
conventional ways.

20 It must also be understood that further variants may
be applied to the device comprising the resiliently
compensated wire tensioner to which this invention
relates without thereby going beyond the scope of
what has been described and claimed below with
25 reference to
the appended drawings and therefore the scope of the
protection of this industrial invention.